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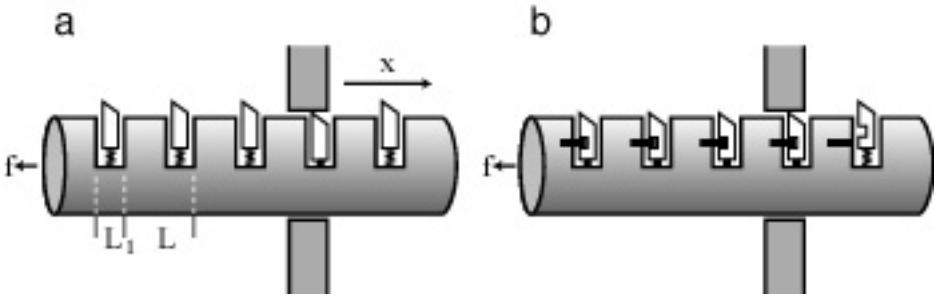
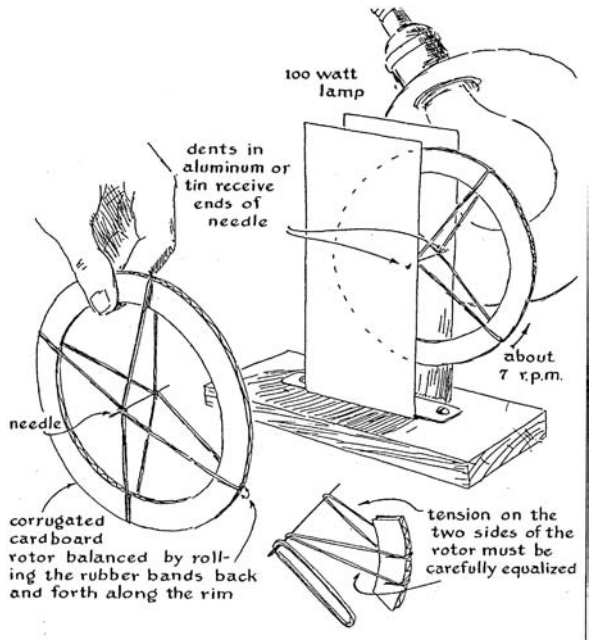
NSF DMR funded the first year of work on my forthcoming textbook "BIOLOGICAL PHYSICS: Energy, Information, Life." This support was crucial in order to create the preliminary materials needed to attract a front-line textbook publisher; the book is now under contract with W. H. Freeman, Co.

BIOLOGICAL PHYSICS connects classical biophysics to the latest work on topics like molecular motors and ion channels. It also covers many issues emerging as key elements of nanotechnology, such as entropic forces and self-assembly.

BIOLOGICAL PHYSICS is rich with real experimental data, and contains about two hundred problems, many of them conceptual, context-rich questions connected with current published research. A separate instructor guide gives the solutions to all the problems, along with suggestions for additional lecture material, in-class demonstrations, research paper topics, and so on.




Every chapter of BIOLOGICAL PHYSICS connects abstract physical concepts to everyday examples. Right: the rubber-band heat engine demonstrates the entropic origin of rubber elasticity; the instructor is invited to construct simple demos of this sort to bring the topic to life. Left: thermal ratchet models provide the crucial conceptual bridge between the mechanical world and the world of single-molecule motors. Students learn how mechanochemistry works by studying both simple models like this one and real motors like kinesin.

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Students will encounter both historical case studies in biological physics and the latest results on single-molecule manipulation. Left: Max Delbruck and colleagues' historic 1932 study of the dose-response curve for X-ray mutagenesis led them to the daring prediction of a long-chain molecule as the carrier of genetic information, decades before Watson and Crick identified that molecule as DNA. Right: the overstretching transition in a single strand of DNA. Data courtesy of C. Bustamante. Students will learn how to fit real data such as these to simple mathematical models (solid curve).